



# VU Research Portal

## Sustainable Mobility and Globalisation: New Research and Policy Challenges

Nijkamp, P.; van Delft, H.T.; Veen-Groot, D.B.

1998

### **document version**

Early version, also known as pre-print

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

Nijkamp, P., van Delft, H. T., & Veen-Groot, D. B. (1998). *Sustainable Mobility and Globalisation: New Research and Policy Challenges*. (Research Memorandum; No. 1998-18). Faculteit der Economische Wetenschappen en Bedrijfskunde.

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)

)

## **SERIE** RESEARCH MEMORANDA

Sustainable Mobility and Globalisation:  
New Research and Policy Challenges

Peter Nijkamp  
Hadewijch van Delft  
Danielle van Veen-Groot

Research Memorandum 1998-I 8



SUSTAINABLE MOBILITY AND GLOBALISATION:  
NEW RESEARCH AND POLICY CHALLENGES

Peter Nijkamp  
Hadewijch van Delft  
Danielle van Veen ■ Groot

## 1 Prologue

The Greek philosopher Heraclitos has once summarised his view on the world concisely in two words: 'panta rei', which means: everything is in motion. This statement seems to apply very well to our modern world, where mobility, interaction and communication have become a leading characteristic; motion is the driving force of progress. The increasing mobility (persons, goods) is also a world-wide source of much concern. Clearly, mobility is a 'normal' and even positive phenomenon in a growing economy; it may increase economic efficiency through the gains of trade and labour mobility and it also offers more social opportunities to all members of society through a better access to a wide variety of amenities. But there is a growing awareness that the positive effects of mobility are offset by negative externalities, such as environmental pollution, congestion or lack of accessibility, and high accident rates.

There have been numerous studies on the positive impacts of transportation on the development of regions and cities (see for an overview Bruinsma and Rietveld 1998). Also the social costs of mobility have been studied quite extensively (see for an in-depth survey Verhoef 1996).

An important question is of course whether the current trends in mobility growth will come to a standstill. Governments all over the world witness serious concerns on the impact of CO<sub>2</sub>. Many policy documents express a curbing of the mobility growth curve as a major target, but it is questionable whether this reversal of trends is to be regarded as a realistic or plausible option. Experts predict that the chances for a drastic change in mobility behaviour are extremely low (see Nijkamp et al. 1998). Also the recent Kyoto agreements are extremely modest in light of the expected rise in welfare and people.

There are many forces at work which induce even more mobility. Of course, there are changes in behavioural patterns (e.g., a high expenditure pattern for mobility, a higher willingness to migrate, a rise in leisure activities, an increase in female labour force participation, a tendency towards an ageing society, and so forth). But there are also many structural developments in the world economy and in a modern production system which induce high mobility modes of living. The focus here will mainly be on the latter type of driving forces, which are hard to change. These key forces will be mapped out in a compact manner. We will then try to trace the consequences of various types of possible scenarios at the interface of the society and its mobility for a distinct set of relevant welfare indicators in our economies. The paper is organised as follows (see also Figure 1).

First, we will describe the changing perspective of a mobile society (Section 2). Then we will map out in Section 3 the global playing field of a modern industrial and service economy. These background notions will be deployed to assess future mobility patterns by distinguishing four contrast scenarios (Section 4). Then we will pay attention to the foreseeable bottlenecks in such future developments (Section 5), while we will also address various policy dilemma's in a complex multi-actor world (Section 6). Section 7 will focus on policy options and promising opportunities and will culminate in strategic recommendations for policy.

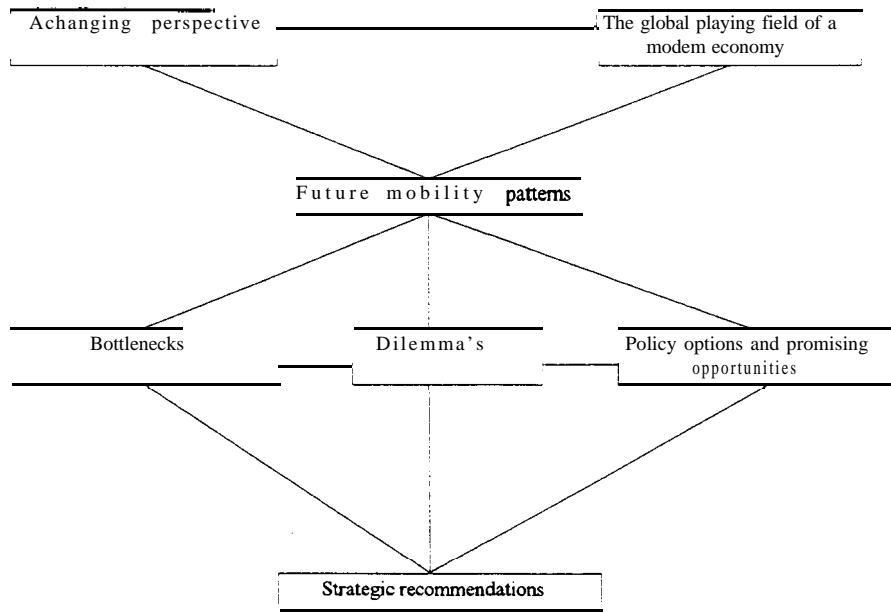


Figure 1 Organisation of the paper

## 2 A Changing Perspective

### 2.1 Introduction

The transformation from stable development to structural dynamics is a marked and noteworthy feature of our modern economy. The external environment of business life has drastically changed in recent years: new markets, new international policy arrangements, new technologies, new tastes of consumers etc. Business life is faced with a great variety of new challenges and opportunities. In this section we will address four major driving forces impacting on mobility behaviour and the expected consequences for economic activities (see Figure 2). These four drivers are: the emergence of global markets, the developments of industrial networks reflected in particular in various forms of outsourcing, the rise in flexibility in working arrangements leading to a 24-hours economy, and the trend towards economic and political power concentration in large-scale agglomerations.

### 2.2 Emergence of global markets

Although it is definitely exaggerated to call our world a global village, it cannot be denied that the action radius of economic activities has increased to an unprecedented degree. Especially the rise of global markets and global players is noteworthy. The globalisation trend does not only lead to more spatial flows of goods, services, persons and information, but is also accompanied by new foreign investments, not only in the industrialised heartland of our world, but in all regions where new opportunities are likely to emerge. This means that there is a trend towards a Schumpeterian economy with a strict competition for new market opportunities.

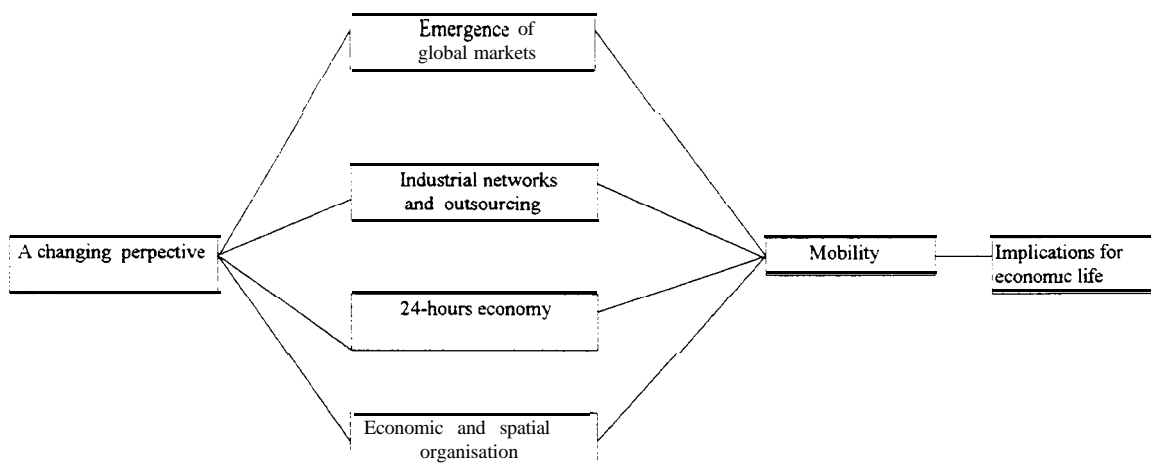


Figure 2 Driving forces of mobility

In the same vein we observe also the development towards globally operating commercial companies (Pizza Hut, Marks & Spencer, etc.). The globalisation trend is also reflected in world-wide integrated product markets, access to a global stock of knowledge and technology, and the emergence of global capital markets. The improvement in transportation technology and the extension of transportation networks causes also a geographical spread of commodity markets.

Since our world is getting smaller all the time, business enterprises are inclined to shift their operation towards locations with the most favourable cost-efficiency or productivity. New competitive factors seem to become important drivers of location and investment decisions of entrepreneurs. This does not only hold for globally operating, multinational companies, but also - and increasingly - for firms with a local or regional sales market, which are faced with strong competition from outside.

In a competitive global market we do observe monopolistic competition elements with distinct market niches, a phenomenon sometimes called the 'hamburger economy'. This type of economic organisation is based on rationalised and standardised products (Coca-Cola, MacDonalds, etc.), which have a world-wide image, so that marketing activities may have a high penetration rate. Thus, it seems that the trend towards global markets will be accompanied by a trend towards world-wide market niches.

### 2.3 Industrial networks and outsourcing

A phenomenon that is accompanying the current globalisation is the trend towards a network economy at all levels: local, regional, national, global. Industrial interdependencies are emerging in an attempt to minimise costs in a mature industrial economy, in particular through outsourcing. The fierce competition in mature markets leads to a trend towards a concentration on core activities, with a strong emphasis on a logistic organisation of production. Physical production may then become more fragmented with a loss of integrated chain production within the firm, while assembling and distribution gain in importance. The emerging component industry is based on world-wide trading and transport (cf. Lagendijk 1994).

The new information and communication technology (ICT) sector allows for a sufficient and efficient co-ordination of dispersed production patterns. Production tends to become also more footloose, due to the integrating potential of the ICT sector. Global networks are supporting this phenomenon, not only in terms of industrial linkages, but also in terms of infrastructure networks. Such networks which are based on high mobility are thus becoming the vehicles for intensive global competition,

#### **2.4 Flexible labour organisation and the 24-hours economy**

From a socio-economic perspective, we witness a clear break with the past. Instead of a standard working week of 40 hours with fixed working hours during 5 days a week, we observe at present a tendency to totally different types of labour organisation and working arrangements. More labour force participation of traditionally non-active population segments, more part-time jobs, more flexible wage contracts and more shifts towards work at other times of the day are the signs of a rise in flexibility on the labour market. This flexible behaviour is also accompanied by shifts in consumer behaviour (e.g., shopping behaviour in the evenings or on Sundays). Thus, the daily time span of economic activities is extending towards a 24-hours operation of the economy. This is also reflected in the industrial sector which tends to move towards multiple shifts in order to make the most efficient use of the capital stock. In a globalising economy this flexibility is also important, as it allows for direct world-wide contacts despite the existence of time zones. The emergence of call centres is a good illustration of this phenomenon.

This flexibility in working arrangements leads also to a rise in personally-tuned modes of transport. Mass transit may then become problematic, as the mass flows which make public transport profitable are only compatible with the traditional labour model. On the other hand, the existing infrastructure may be used more efficiently in case of flexible working arrangements, thus leading to a decline in congestion growth.

#### **2.5 Economic and spatial concentration**

In a networked economy, nodal centres play a strategic role. Hubs are then able to acquire a dominant position. Such nodal centres refer to industrial power concentration in the form of global oligopolies controlling a significant part of the world market, but they refer also to mainports and gateways in international infrastructure networks. It is without any doubt that proximity effects • through their intense communication possibilities • offer many scale advantages. Although the ICT sector may suggest a 'death of distance', fact is that geographical agglomeration forces are becoming increasingly important for the complex ramification of an industrial network economy. Thus scale economies of all kind seem to favour concentration and agglomeration, while at the same time the ICT sector allows for a spatial spread of production. Clearly, the economies of density and scale may be affected by congestion and accessibility problems, thus causing an outflow from central city areas (CBD's) to suburban areas and new extra-urban locations (such as the edge city), but the main orientation still remains to the city as the pole of innovation, incubation and communication (see Capello et al. 1998). The

resulting mobility patterns are then diverse: mass flows between major metropolitan areas and diffuse flows within the metropolitan area.

## **2.6 Implications for economic life**

There are clearly changing perspectives for modern business life, which will impact on mobility patterns. There seems to be an overriding trend towards higher mobility rates, although the resulting patterns are not always unambiguous. For example, globalisation may be reflected in more trade and transport, but it may also be that globalisation leads to more regional outsourcing and concentrated regional foreign investment. In the latter case new systems of regional markets may emerge, which include a lower mobility rate than a uniform globalisation development. Thus, the geographical scale at which a phenomenon takes place may be decisive for the change patterns in mobility rates.

Another phenomenon is the emerging specialisation and market niche orientation which prompt logistic and storage capacity challenges. These tendencies are also reflected in changing consuming behaviour (such as homeshopping, information provision via Internet etc.). This may also have complex mobility consequences, which may however differ per region or economic sector. It seems plausible that overall the above described changes in external environments of modern business life are facilitated by and in turn lead to high mobility transport systems, but the relationship between these two phenomena is not a rectilinear one. As a consequence, it will also be hard to infer unambiguous conclusions on the likely mobility patterns in future socio-economic and spatial ramifications of our society. Clearly, the predictive power of our analytical apparatus is insufficient to infer unambiguous mappings of the **future** mobile society. This issue will be taken up again in the context of scenario thinking in Section 4, but first we will focus on the new playing field for business life,

## **3 A New Playing Field**

### **3.1 Introduction**

The current transformation processes are of a pervasive nature. It is no surprise in light of the changing perspectives that infrastructure - in combination with transport systems - is increasingly regarded as the carrier of new spatial-economic developments. Consequently, due attention is increasingly given to free access, capacity, efficiency, convenience and price of infrastructure, especially in a European setting where the unification process is critically dependent on trans-border infrastructure networks. In this section we will pay particular attention to the enlargement of the action radius of goods, persons and information, their implications for urban development and for economic developments in general. The structure of this section is depicted in Figure 3



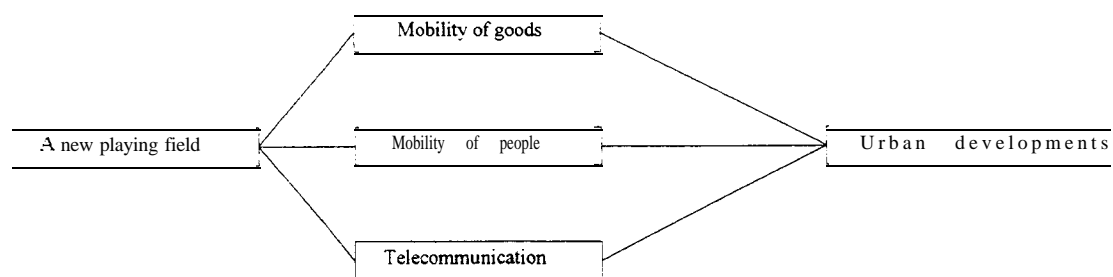


Figure 3 Mobility in a new context

### 3.2 Mobility of goods

The volume of goods transported has shown a steady rise in the past decade. For example, the growth in road freight transport in the Netherlands in the past years has been about 3.5%. Clearly, this growth figure is related to the internationalisation of our economies. In this context, the OECD (1997) has made a distinction of four categories of effects of the globalising activity patterns on the economy:

- \* scale effects: efficiency effects due to economies of scale and density
- \* structure effects: changes in the composition and location of production and consumption centres
- \* technological effects: emergence of new patterns of development and dispersion of technologies
- \* product effects: changes in the product-mix.

These effects will have both quantitative and qualitative impacts on mobility patterns. As mentioned above, the volume impacts are dependent on the qualitative composition of commodity flows, but also on the volume of these flows. Furthermore, there may be far reaching consequences from the current regionalisation tendencies. And finally, new transportation systems (such as subterranean transport) may have drastic consequences for the costs and benefits of current surface transport modes. In conclusion, globalisation may manifest itself in a trend toward regionalisation or even to mixed spatial modes such as ‘glocalization’, which is a blend of regional self-reliance and global orientation.

### 3.3 Mobility of people

The closed economic communities from the past with fixed social and cultural structures and characteristics have largely vanished and been replaced by open, emancipatory and outward-looking individuals with a focus on urban or international life. This has had significant consequences for mobility behaviour, as the increased action radius (reflected inter alia in suburbanisation and long-distance tourism) has allowed modern man to be part of a widely-ranging network society. In addition to traditional journeys from home to work, we also witness a sharp rise in social and leisure mobility, in which the car is the dominant travel mode.

Government policy in many countries has even favoured the above sketched development, due to a support for new towns, growth centres, population dispersion etc. Only recently, we observe countervailing policy strategies oriented towards more spatial concentration (e.g., compact cities).

Clearly, the rise in mobility has been favoured by the general rise in welfare in the past decades. This is mainly reflected in high car ownership and numbers of kilometres driven. The transportation sector is one of the few sectors where the growth of CO<sub>2</sub> emissions has not yet come to a standstill, so that the environmental consequences of the modern mobile society are certainly a source of much concern.

### **3.4 Telecommunication**

Besides the mobility increase of people and goods, we observe also the trend towards a modern information society dominated by the ICT sector. The informatisation of a modern economy is accompanied by a high throughput of material flows. To a large extent, telecommunication is a supporting carrier for the modern transport sector (and sometimes it even stimulates more physical flows), and to a minor extent it may act as a substitute (e.g., in case of teleshopping, telecommuting, distance learning, etc.). But even in cases where the ICT sector would replace physical movements, we observe a tendency of people to use the additional discretionary time for other types of mobility patterns, so that the net effect may be negligible (or sometimes even negative).

In any case, the general observation is that for the time being there is a great need for face-to-face contacts in a modern network society. Since the social reference group is no longer the local village, but sometimes the so-called global village, it seems plausible to expect a continued rise in mobility, if no further counter-actions are undertaken.

### **3.5 Urban developments**

In most western societies, some 65 to 70 percent of the population lives in cities. Thus, the mobile society is large accompanied by an urban society. And clearly, the mobility patterns have an influence on the way of living of modern man. In general, major cities have become the socio-economic and cultural focal point of most inhabitants, even if they live at quite some distance from the city. Such a long-distance orientation is also facilitated by the ICT sector. Also modern business life witnesses a tendency towards spatial deconcentration, even though the contact, communication and management patterns are still oriented towards large urban agglomerations. Thus, a modern city is exhibiting a combination of positive and negative scale economies, which are directly connected with the transportation and land use sector.

The negative externalities of geographical mobility have prompted a series of policy measures at both the supply side (e.g. infrastructure, modal split) and the demand side (e.g., parking policy, gasoline taxes etc). Clearly, the spatial lay-out of local, regional, national and international economies lies at the heart of the mobility issue. Consequently, there is also much interest in physical planning measures (e.g., compact city design, bundled deconcentration etc.). Despite the wide range of policy strategies available and implemented, the actual success of policy in reducing mobility growth has been very modest. Apparently, there are so many barriers, resistances and uncertainties in

sustainable transport planning that immediate success is not likely to occur. But what will the future bring us? This question will now be investigated by the use of scenario methods.

## 4 The Future of Mobility in Scenarios: The Spider Model

### 4.1 Introduction

Mobility shows up in a force field of two contrasting developments. Economic growth and global networking provoke a continued rise in mobility. For example, van Doren (1991) in his 'opus' on 'A History of Knowledge' expects a further exponential growth of the daily action radius of people in the future up to a level of 3000 miles in one century from now, which can be travelled comfortably. Others, on the other hand, claim that the mission of sustainable development would require a trend towards slow motion and a lower action radius (see for an overview Nijkamp and Baaijens, 1998). The main question in our paper is not: what is the most probable future option? Rather we address the question: which future patterns can be imagined and how can policies cope with them? In order to study these questions, we will focus in the sequel of this paper on a chain of three analytical steps (see Figure 4).

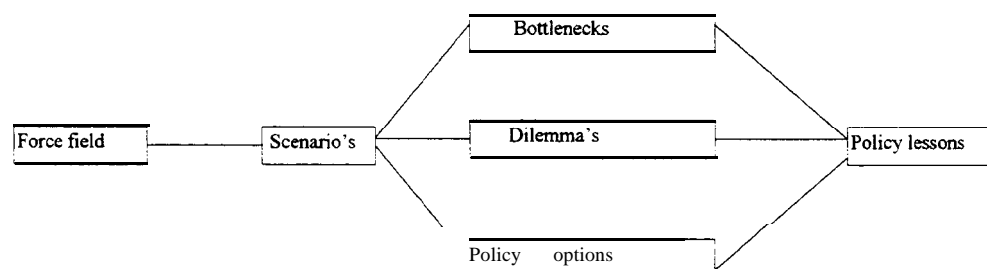


Figure 4 Analysis framework

Each of the issues will now be dealt with in more detail

### 4.2 A force field analysis

It is generally accepted that transport is normally a derived demand and hence dependent on decisions taken elsewhere or based on different purposes than cost minimisation. However, in taking decisions on how to bridge distance, individuals cause a great many externalities which show up as uncompensated costs for others. Sustainable mobility would then require an incorporation of such external costs in transport decisions, which are in turn caused by key forces taking place elsewhere. The following key forces - presented by way of a contrast analysis - can be distinguished (see van Geenhuizen en Nijkamp 1997).

- \* **internationalisation.** On the one hand, the expansion of entrepreneurial activities towards world markets may imply totally different transport systems or movements, but on the other hand there is a tendency towards regional and local production systems, which would require a regional focus in the transport system. In this context, global competition and regional self-reliance may be seen as contrasting forces.
- \* **environmental protection.** Clearly, on the one hand, we may witness a tendency towards continued economic growth, with the environment acting at best as a constraint, whereas on the other hand an ecological orientation may be favoured which would presuppose a change in life styles and human behaviour and also a diminishing 'growthmania'.
- \* **social cohesion.** In a modern society we observe a trend towards individualisation with a strong emphasis on freedom and self-determination, in contrast to other or previous societies where collective care and solidarity were the preponderant social values.
- \* **spatial dispersion.** Also here we observe contrasting developments: a de-urbanisation trend leading to long-distance community based on private cars and high mobility rates versus a compact urban pattern of living in which collective modes of transport are dominant.
- \* **spatial equity.** Modern economic and technological developments are increasingly focused on metropolitan areas, whereas at the same time there is a broad recognition of the need to favour less central areas or to exploit the potential of such areas (e.g., in case of outsourcing).
- \* **accessibility.** Since the plans to give priority to Trans European Networks (TEN's) there has been much debate on the distributional aspects of new infrastructure policy. TEN's may favour economic progress in well connected urban areas, but may cause a backwardness of regions not connected to the TEN's.
- \* **economic policy.** In the past decade we have witnessed a drastic change in economic policy in many countries. On the one hand, we have seen a clear change towards more deregulation and privatisation, whereas on the other hand we also hear signals on the need for re-regulation and a co-ordinating role of governments.
- \* **decoupling.** In recent years the idea of decoupling has become very popular (reflected inter alia in notions like de-materialisation, **informatisation**, industrial transformation, Factor 4 etc; see also Von Weizsacker et al. 1997; Van Veen-Groot and Nijkamp 1997). The background of this concept is that there is a need to have a continued economic growth without eroding at the same time the environmental and resource base of the economy. This provokes the question whether economic growth would have to be favoured for its own sake, or whether part of the economic growth would have to be used for social change and technological conversion.

The previous force fields can be summarised as follows:

#### Driving forces

- internationalisation
- environmental protection
- social cohesion
- spatial dispersion
- spatial equity
- accessibility
- economic policy
- decoupling

#### Development

- global competition vs. regional co-operation
- efficient growth vs. ecological life styles
- individualisation vs. solidarity
- de-urbanisation vs. compact city design
- metropolitan focus vs. regional outsourcing
- European networks vs. regional networks
- market orientation vs. a social market model
- economic growth vs. environmental sustainability

The previous forces and developments can be mapped out in various ways. For example, one may depict the contrasting forces of integration-fragmentation versus regionalisation-globalisation. This results in the following two-by-two configuration (see Figure 5).

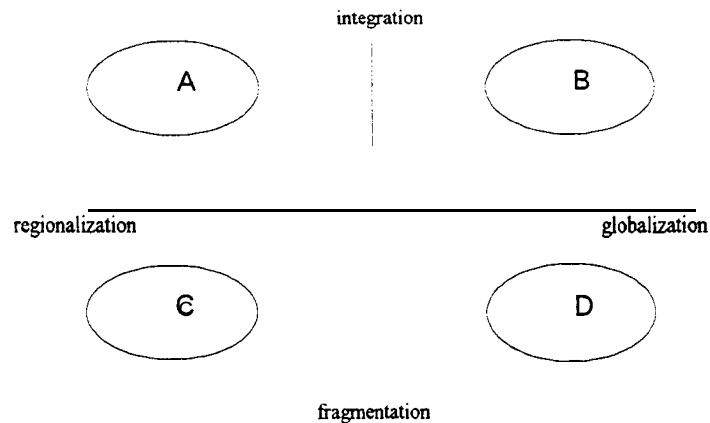


Figure 5 An illustrative mapping of some global forces.  
Source: GBN Scenario Book ( 199 1)

- A: Market competition with many small players
- B: Market competition with super-blocks
- C: Global incoherence and instability
- D: Protectionism with small players

Clearly, Figure 5 is merely illustrative and other, related force fields can be depicted as well. These driving forces will now be used as the building blocks of our scenarios to be described in Subsection 4.3.

### 4.3 Spatial and transportation scenarios

Many regions of the world (Europe, the Pacific, Latin-America etc.) go through a stage of drastic restructuring, as pointed out above. To obtain a reliable long-term view

on the most likely development patterns of these economies is a challenge, but in practice almost an impossibility. The time horizon of most models does usually not extend towards a period of more than a decade. For long-term forecasts we often resort to simulation models, chaos models, bio-computing models and the present. Against this background, we observe nowadays a great popularity of scenarios.

Scenarios are visions on and images of the future, put together in a consistent way but without claiming necessarily a high degree of realism. A scenario is a decision support tool which is meant to act as a tool for communication and reflection, with a view on generating policy debate and action on an uncertain future (see e.g. Nijkamp et al. 1998). There is a great variety of scenarios: backcasting vs forecasting scenarios, extrapolation vs contrast scenarios, and so forth. In the light of the previous observation, we will describe here four illustrative scenarios.

This four scenarios will next be mapped out and interpreted by means of the recently developed SPIDER-model (see for full details Nijkamp et al. 1998). This model is a qualitative representation of the major substantive components of a future spatial-transportation image. It incorporates four axes which aim to map out in a qualitative rank order the strategic features of these future options. The meaning and interpretation of each of the axes in the four quadrants originate from the driving forces described above. First, the substance of the four scenarios will be outlined, while next we will visualise their characteristics in the SPIDER-model.

#### **a. Growthmania**

In the 'growthmania' scenario all policies and actions serve to stimulate economic growth and wealth. This means an emphasis on economic and technical efficiency, individual ambition and a liberal land use policy (including inter alia a **deconcentration** of cities). There is of course a shift to a drastic privatisation of the transport sector (e.g. privatisation of public transport, liberalisation of transport regulations). The consequence will be a low share of public transport and a high ownership and use rate of private cars. High income groups are mainly found in spacious green areas at the edge of cities; low income groups live in older urban areas, while medium income groups tend to live in suburban areas at some distance from the city centre. Thus, there is a clear socio-economic and spatial segmentation of society. In general, this scenario is based on high mobility rates whose social costs can at best be redressed by road charges. But, in general, there is not a high priority attached to environmental sustainability issues, so that the geographical patterns of living and working more or less mirror socio-economic welfare positions of citizens.

#### **b. Technomania**

The 'technomania' scenario takes for granted that the problems inherent in scarcity of land, transportation externalities and environmental decay can be mitigated and solved by the introduction and adoption of modern technology. This pertains to the ICT sector (encouraging electronic road-pricing, tele-working, tele-shopping etc), but also to energy, environmental and vehicle technology (e.g. fuel cells). The flexibility in labour organisation (e.g., multiple shifts, flexible office and shopping hours etc) helps to create also new adjustments to changing conditions. The road transport sector may experience efficiency gains as a result of the introduction of electronic control devices. Also new

infrastructure options (e.g., subterranean facilities) will be constructed in order to reduce the social costs of transport. In general, the scarce space is used in the technically most efficient way. This scenario places much emphasis on R & D, education and mobility, so that access to 'technomania' is mainly reserved for citizens well trained in the use of modern technology. This technology is able to curb the exponential growth curve of mobility increase.

c. **Sociomania**

The 'sociomania' scenario is based on collective interest and action, with an emphasis on social security, social housing and employment. Likewise, public transport is strongly supported and abundantly subsidised. The spatial lay-out of cities reflect a mix of living, working and recreation. Urban planning aims to create high densities, which also means subterranean planning solutions (e.g., underground parking garages, partly underground shopping malls and multi-layer department stores). Cities are meant to be socially integrated, while long-distance commuting is an exception. There is much interest in buying and consuming locally (or regionally) produced goods. Thus, this spatial-transportation model is based on socio-economic solidarity and a geographical distribution characterised by social cohesion. There is a strong role for the government, while the fiscal burden is high. Clearly, the decline in action radius means a low mobility level, while the extensive use of public transport stimulates also environmental sustainability at the local level.

d. **Ecomania**

Finally, the 'ecomania' scenario is a clear break with the past. The preponderant objective is to save the environment through a reduction of mobility. This means first of all a large-scale introduction of polluter pays' principles (e.g. parking fees, user charges, congestion levies) but also the establishment of strict standards, land use and energy saving regulations (including compact city design) etc. As far as possible, this eco-scenario also uses the potential offered by modern technology (e.g., traffic management). Furthermore, a modal split is strived for, mainly in favour of railways and other modes of public transport. This also means that the accessibility of cities improves. It is clear that decoupling is a major strategy in this 'ecomania' scenario, accompanied by new vehicle technology (e.g. electric cars). This scenario presupposes also a strong international co-ordination of environmental and transportation policies, and in general a strong involvement of governments.

After the description of these four scenarios, it is important to interpret some of the underlying developments and to draw some policy lessons. This is particularly important, as scenarios may be **helpful** in identifying contingencies and bottlenecks in development, so that also policy strategies can be envisaged. This issue will be further taken up in the next subsection.

## 5 Contingencies in Scenarios

The four ‘mania’ scenarios described in Subsection 4.3 can also be visualised in an overview diagram that is based on the SPIDER-concept (see Figure 6). This figure is more or less self-explanatory. It should be noted that the scores on the attributes of each scenario are based on qualitative rank orders, so that the results can only be interpreted in a qualitative sense. The size of the area within the envelope curve of each scenario has of course no absolute meaning.

A closer investigation of the results of the scenario mappings clarifies that in ‘**growthmania**’ accessibility will likely be the most severe bottleneck. The drastic mobility rise leads to an intensive use of infrastructure and parking facilities; this holds for both people and goods. only information-intensive enterprises may face less problems. Without large-scale infrastructure investments, this scenario will meet strong capacity constraints, leave aside environmental quality constraints.

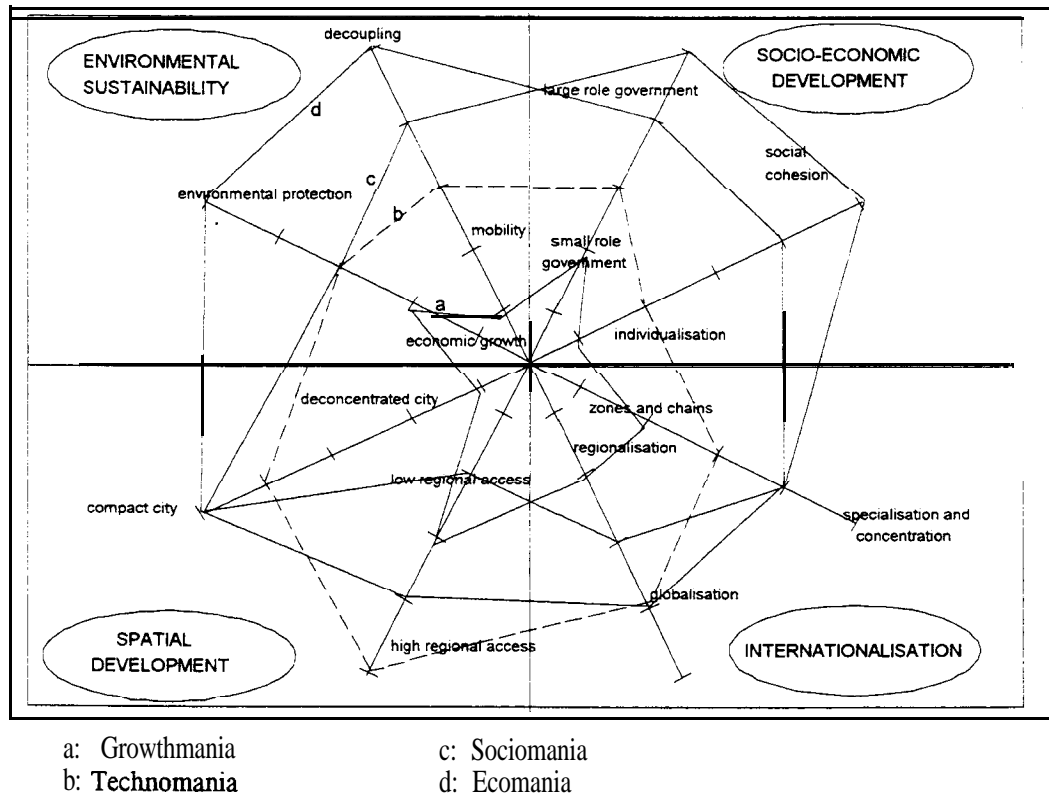


Figure 6 The Spider model

Next, the ‘**technomania**’ scenario exploits the fruits of modern telecommunication and of the ICT sector in general. Also sophisticated forms of new vehicle technology are to be expected and used. Inner cities will however, face a problematic accessibility by



private car. The use of the ‘third dimension’ (or ‘vertical’ solutions) plays also a dominant role in mitigating land use and transportation problems.

In the ‘**sociomania**’ world the dynamic forces in economic life are less dominant; there is much emphasis on the maintenance of stable local or regional markets. Public transport serves thus as a connecting network activity. This requires high density flows and spatial concentration. The high taxes in this scenario lead to a relatively low discretionary income, so that by definition the expenditures on luxury mobility will be lower.

Finally, we will briefly look at the ‘**ecomania**’ image, where the environment is regarded as the most precious and privileged sector. Pollution costs are then fully internalised, be it via gasoline taxes, road taxes, or parking fees. Mobility is not forbidden, but strongly discouraged. Furthermore, governments are supposed to invest heavily in environment-benign transport systems. Consequently, there will be a tendency toward geographical concentration. The high costs of transport will discourage peripheral or isolated firms and amenities.

The previous observations and findings can concisely be summarised in the following survey table (see Table 1)

Scenario	Bottlenecks	Solution strategies
a	Parking facilities Poor public transport Urban quality of life	Market-based parking fees New forms of distribution/logistics Flexible work organisation
b	Technological inertia Knowledge acquisition/transfer	Encouragement of innovativeness Subterranean infrastructure Telematics and ICT
c	Fiscal burden Spatial concentration	Local/regional production Strong public transport
d	<b>High</b> costs of transport Spatial density	Railway and public transport investments Local/regional policy focus New forms of distribution/ logistics

Table 1 A survey table of bottlenecks and solution directions of the four ‘mania’ scenarios.

## 6 Contradictions in Transport

The above ideas may also be helpful to understand paradoxes in scientific statements on the transport sector. European countries and regions are gradually moving towards an integrated network economy, where important nodes of economic, cultural and technological progress are linked together by a well connected infrastructure

network (cf. also Banister and Berechman 1993). Since the approval of the Maastricht Treaty the notions of interconnectivity, interoperability and intermodality have gained much popularity, as it is recognised that a network is more than the sum of nodes and modes. In particular, the synergy offered by networks (e.g., value added networks) offer a decisive advantage, but the intensified use of European networks has also many shadow sides.

The role of transport in a modern society is a source of much scientific debate and policy concern, surrounded by much uncertainty and hence diverging views. Transport is one of the most dynamic sectors in the European economy and reflects at present the transition from a fragmented and protected space-economy to an integrated and open European market. But at the same time, the access to and benefits from the European network are unequally distributed among different socio-economic groups and among different regions in Europe, so that serious equity problems emerge. And finally, the large-scale mobility resulting from the European **free** market is a cause of many environmental externalities and hence of serious criticism.

Against this background, European transport policies also have an ambivalent character. On the one hand, there is a dedicated policy to exploit the benefits of the integrated European market by constructing Trans European Networks (e.g. the rapid train system). On the other hand, there is the need to offer to all European citizens free access to well-developed infrastructure networks at all geographical levels. And finally, there is the target to keep the environmental consequences of the transport sector within sustainable limits.

In the light of these observations, European transport policy is faced with many challenges. More people express their right to be more mobile; more European countries and regions want to be connected to European networks; and more people express their concern about environmental quality in Europe. This provokes a series of fascinating policy research issues. Can the justified needs of all European be met within the existing infrastructure capacity? Are different forms of mobility patterns and life styles necessary? May telecommunications technology offer a promising solution (e.g. tele-working)? Or is a different geographical organisation of the European space-economy needed?

It seems that the severity of these problems call for direct and immediate action. In this context, several European countries are designing a number of regulatory and economic counter-incentives (Austria, Germany, France, etc.). In addition, the inevitable problem of road congestion on important European corridors deteriorates efficient transportation conditions. All of these issues call for a concrete and coherent European transport policy. In this respect, the Transport White Book of the European Commission (1993) states: "*The activities of the European Community in the **field** of research and development regarding transport must supply the new tools for the attainment of sustainable mobility: **efficient**, safe transport, in the best possible social and environmental circumstances*".

Despite all policy ambitions the road towards a uniform policy is not straightforward. Many dilemma's have to be faced and overcome. We will discuss here a few of such illustrative contradictory developments by means of concise statements and key explanations:

### □ **double causality**

- a. Infrastructure is a necessary but not sufficient condition for economic growth
- b. Economic growth is necessary, but not sufficient condition for new infrastructure investments

**key:** the main question is one of financing and distribution of public funds; in case of a mismatch there is the phenomenon of missing links and missing networks which may hamper a balanced development.

### □ **flying carpet**

- a. The historically low prices of international travel mean that mobility growth will not be stopped
- b. The growth in mobility will have to come to a standstill because of environmental constraints

**key:** the absence of market-based regulatory regimes (including unpriced externalities) causes a major disturbance in mobility which favours free ridership.

### **3 infrastructure capacity**

- a. On average there is sufficient infrastructure capacity
- b. In the margin there is insufficient infrastructure capacity

**key:** a major problem arises from the absence of a properly functioning price system in particular peak load pricing.

### **3 telematics**

- a. Telematics is necessary to ensure efficient transport
- b. Telematics will cause additional congestion

**key:** telematics in itself is just a technological mechanism and ought to be complemented with a system of 'carrots and sticks' on human behaviour to ensure a balanced solution.

### □ **sustainable mobility and capacity expansion**

- a. Sufficient infrastructure capacity increases the chances on sustainable transport
- b. Excess infrastructure capacity decreases the chances on sustainable transport

**key:** the validity of the law of Say ('each supply creates its own demand') can only effectively be coped with if there is a fully operating user charge system.

### □ **infrastructure costs**

- a. Infrastructure costs are normally underestimated
- b. Infrastructure planners (engineers, economists) are reliable accounting experts

**key:** there is a problem of missing effective and consistent policy-making institutions, so that at present in a democratic society there will be a natural tendency towards overspent budgets.

### **3 competitiveness and peripherality**

- a. An improvement of transport is a necessary condition for integration of Central • and East • European countries
- b. Infrastructure expansion towards the East is not necessarily favourable for the economies of Central • and East • European countries

**key:** there is insufficient recognition of the market potential of remote areas, and there are insufficient added value strategies.

### □ **Trans-European networks**

- a. Trans-European Networks are good for Europe

b. Trans-European Networks are better for nodal centres in Western Europe and worse for the hinterland

key: the main problem with the TENs is formed by the differences in spatial accessibility of these networks, so that equity issues are aggravated.

This list of dilemma's and paradoxes is not exhaustive, but offers a good illustration of the great many challenges faced by the transport sector. The need for proper policy responses is high; we will offer a few of them in the final section.

## 7 Policy Opportunities and Lessons

### 7.1 Introduction

In this final section we will examine some possible policy consequences from the perspective of the above scenario analysis. Sustainable transport policy presupposes a multi-faceted and also multi-layer policy ramification. Two broad levels of policy-making may be distinguished, viz. national/international and local/regional. These two levels have also different opportunities for developing and implementing strategies to favour sustainable mobility. This is briefly summarised in Figure 7.

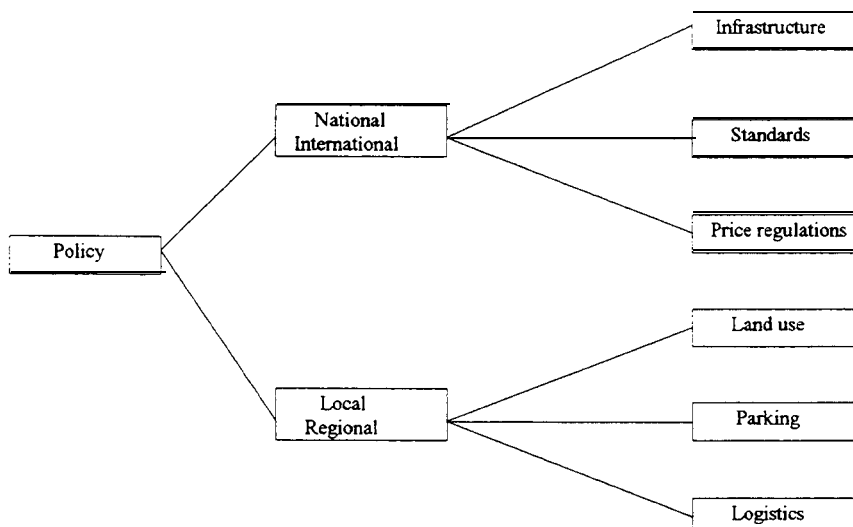


Figure 7 Policy fields

Some concise remarks on the possibilities and flexibilities of various policy strategies will now be made.

### 7.2 National/international policy

The following important (but certainly not exclusive) areas of policy intervention aiming at sustainable transport from a national/international perspective may be envisaged.

## **Infrastructure**

Infrastructure is not only a matter of supply (how much, which kind, where), but it also has to be offered at a reasonable market price. Thus, financing and pricing are critical success factors for an infrastructure policy aiming at favouring a sustainable transport system.

## **Standards**

An important policy tool is the formulation and enforcement of standards on sustainable mobility, e.g. on maximum emissions per car, on vehicle design and technology (e.g. catalytic converters), on speed limits, on safety regulation, on traffic management etc. Such common agreements are also needed in order to avoid the emergence of different environmental and transport policy regimes which might violate the principle of equal competitive conditions between regions or countries.

## **Price regulations**

Market-based price interventions are usually regarded as efficient means to achieve a fair balance in case of social costs. Such price measures may incorporate taxes, charges, fees, but also subsidies. The main problem here is not the economic underpinning, but the social acceptance and feasibility (see Verhoef 1996).

## **7.3 Local/ regional policy**

It is clear that local and regional policy addresses more specifically sustainability questions at the **meso/** micro level. Three fields stand out here.

### **Land use**

Physical planning has become an important policy vehicle for influencing the size, the mode and the environmental impact of transport. This applies to infrastructure, but also training programmes, industrial location, facility locations and so forth. In general, land use intervention will have a decisive impact on the **future** activity pattern of our modern, mobile society.

### **Parking**

A very effective • though usually not very popular • measure to control **traffic** movements in cities is through a strict system of parking policy, especially for private cars. Parking policy can adopt two forms: reduction of parking facilities or a rationing via a price regime (parking fees). A price system may be able to discriminate between different periods of the day or between different time spans of parking. Clearly, a strict parking policy in cities is usually also meeting fierce resistance **from** local shopkeepers. It seems • given the spatial distributional impacts of parking policy • plausible to develop a more strict parking strategy at a regional level, while being accompanied by a support for local and regional public transport policy.

## Logistics

Distribution of goods and people has become a very complicated task. Modern logistics aims to solve many of such complicated questions, based on cost minimisation (or other performance criteria). Transport is increasingly faced with the question how to organise physical movements in the most efficient way. Therefore, there is a great policy task in offering the best possible logistic facilities, as the value added of modern logistics is usually higher than that of physical transport per se. This situation also explains the current interest in gateways and mainports.

There are also new policy opportunities whose relevance can be clarified by means of the above described scenarios. These opportunities are inter alia:

- **Telematics.** Telematics may significantly increase the efficiency of existing transport networks (see also Nijkamp et al. 1996).
- **Modern technology.** The use of advanced technology may pertain to different transport policy fields, such as vehicle design, road maintenance, noise reduction, safety equipment, automatic goods identification, and so forth.
- **Alternative infrastructure design.** In this context, much may be expected from new forms of construction, such as subterranean solutions, like parking garages, underground warehouses and department stores, transport terminals, but also underground roads or even vacuum tunnelling. The use of the 'third dimension' may also gain importance by constructing office buildings or other facilities as a new layer above existing motorways or railways.

There is a well-known saying which may be helpful for a pro-active transport policy: 'forewarned is fore-armed'. If public policy would be able to specify long-range committing targets to the transport industry (vehicle producers, infrastructure builders and designers, transport users), then it would be much easier to develop effective strategies that would be able to reconcile efficiency, equity and sustainability. But this requires courageous policies, which exploit synergy and create added value for all actors involved. This requires a fine-tuned packaging of policy measures which compensate for losses for classes of actors and which offer a portfolio of various advantages. Such a portfolio approach seems to be the foundation for effective and socially acceptable transport policy in Europe.

## References

- Banister, D. and J. Berechman (eds.), **Transport in a Unified Europe**, Elsevier, Amsterdam, 1993
- Bruinsma, F. and P. Rietveld, **Is Transport Infrastructure Effective?, Transport Infrastructure Accessibility and the Space Economy**, Springer-Verlag, Berlin, 1998 (forthcoming)
- Capello, R., P. Nijkamp and G. Pepping, **Sustainable City and Energy Policy**, Springer-Verlag, Berlin, 1998
- Doren, Ch. van, **The History of Knowledge**, Ballantine Books, New York, 1991
- Lagendijk, **Internationalisation of the Automobile Industry in Spain**, Thesis Publishers, Amsterdam, 1994
- Nijkamp, P. and S. Baaijens, **Slow Motion**, Discussion Paper, Tinbergen Institute, Amsterdam, 1998
- Nijkamp, P., and M. van Geenhuizen, European Transport: Challenges and Opportunities, **Journal of Transport Geography**, vol. 5, no. 1, 1997, pp. 3-11
- Nijkamp, P. and G. Pepping, **Telematics and Transport Behaviour**, Springer-Verlag, Berlin, 1996
- Nijkamp, P., S. Rienstra, and J. Vleugel, **Transportation Planning and the Future**, John Wiley, Chichester/New York, 1998
- OECD, **Economic Globalisation and the Environment**, OECD, Paris, 1997
- Veen-Groot, D.B. van, and P. Nijkamp, Sustainable Transport and 'Factor Four', Paper presented at conference 'Managing sustainability • The European Perspective and Experiences', University of Rostock, Germany, 1997
- Verhoef, E., **The Economics of Regulating Road Transport**, Edward Elgar, Cheltenham, 1996
- Weizsacker, E. von, A.B. Lovins and L.H. Lovins, **Factor Four: Doubling Wealth, Halving Resource Use**, Earthscan, London, 1997